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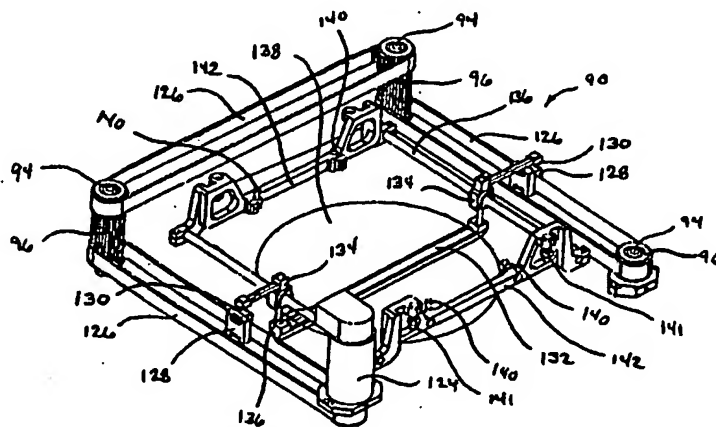
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- (74) Agents: PARKER, Paul, T.; Perkins Coie LLP, P.O. Box 1247, Seattle, WA 98111-1247, et al. (US).
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- (75) Inventors/Applicants (*for US only*): OBERLITNER, Thomas, H. [US/US]; 222 Wintercrest Drive, Kalispell, MT 59901 (US). HANSON, Kyle, M. [US/US]; 110 Greenbriar Drive, Kalispell, MT 59901 (US).
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(54) Title: A MICROELECTRONIC WORKPIECE PROCESSING TOOL INCLUDING A PROCESSING REACTOR HAVING A PADDLE ASSEMBLY FOR AGITATION OF A PROCESSING FLUID PROXIMATE TO THE WORKPIECE



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(57) Abstract: An integrated tool is provided including at least one workpiece processing station having a paddle assembly. In accordance with another independent aspect of the present invention, the workpiece processing station is adapted for adjusting the level of the processing fluid relative to a workpiece, wherein the portion of the workpiece to be processed and possibly the paddle is selectively immersed within the processing fluid. In accordance with a further independent aspect of the present invention, a paddle is provided for use proximate to a workpiece in a workpiece processing station. The paddle includes one or more sets of delivery ports and one or more sets of fluid recovery ports. In at least one embodiment, the paddle provides for agitation of a processing fluid proximate to the surface of the workpiece. In at least another embodiment, the paddle provides for the delivery and/or recovery of one or more fluids to the portion of the workpiece to be processed. One aspect of the present invention enables the fluids supplied to

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/00173

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L21/00 C25D21/10 C25D7/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L C25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 199, no. 602 - & JP 07 284738 A (TOPPAN PRINTING CO LTD) abstract	1-3, 12
Y		4, 15-19, 29-32
A		38
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 658 (E-1643), 13 December 1994 (1994-12-13) - & JP 06 260468 A (TOKUYAMA CERAMICS KK) abstract	1, 12
A		16, 29, 38
	- / - -	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
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T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

* & * document member of the same patent family

Date of the actual completion of the international search

4 October 2001

Date of making of the international search report

12 10 2001

Name and mailing address of the ISA

Authorized officer

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/00173

C(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 11, 26 December 1995 (1995-12-26) -& JP 07 211724 A (CASIO COMPUT CO LTD), 11 August 1995 (1995-08-11) abstract; figure 4 ---	26
X	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) -& JP 10 172974 A (DENSO CORP), 26 June 1998 (1998-06-26) abstract; figure 1 ---	26
X	US 5 344 491 A (KATOU) 6 September 1994 (1994-09-06) abstract; figure 2 ---	26
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X	US 6 001 235 A (ARKEN ET AL.) 14 December 1999 (1999-12-14) column 5, line 59-62 ---	27
X	US 5 421 987 A (TZANAVARAS ET AL.) 6 June 1995 (1995-06-06) column 7, line 10-18 ---	27
Y	US 5 312 532 A (ANDRICACOS ET AL.) 17 May 1994 (1994-05-17) column 5, line 64 -column 6, line 55 ---	4,15-19, 28-32
A		1,9-12, 23-25, 36-38
Y	WO 99 25004 A (APPLIED MATERIALS) 20 May 1999 (1999-05-20) page 6, line 18 -page 7, line 3 ---	28
A	EP 0 726 698 A (INTERNATIONAL BUSINESS MACHINES) 14 August 1996 (1996-08-14) column 9, line 49 -column 10, line 28 ---	1,12,16, 29,38
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 579 (E-1451), 21 October 1993 (1993-10-21) -& JP 05 175158 A (FUJITSU LTD) abstract ---	1,12,16, 29,38

INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 198 (C-502) -& JP 62 297495 A (ELECTROPLATING ENG OF JAPAN CO) abstract	1-3, 12-14, 16-18, 29,38
A	US 5 925 226 A (HURWITT ET AL.) 20 July 1999 (1999-07-20) claim 1; figures 1,38	9-11
A	EP 0 343 502 A (LAM RESEARCH CORPORATION) 29 November 1989 (1989-11-29) figure 2	9-11, 23-25, 36,37
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 09, 30 July 1999 (1999-07-30) -& JP 11 092993 A (TDK CORP), 6 April 1999 (1999-04-06) abstract -& US 6 181 057 B1 (INOUE ET AL.) 30 January 2001 (2001-01-30) column 6, line 17-27; figures 5,6	28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/00173

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/00173

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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JP 11092993 0 A		NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8,12-22,29-35,38-47

Apparatus for plating a layer of material on a workpiece

2. Claims: 9-11,23-25,36,37

Apparatus for plating comprising a plurality of float assemblies

3. Claim : 26

Apparatus for plating comprising a processing vessel with two fluid outlets

4. Claim : 27

Apparatus for plating comprising a magnet

5. Claim : 28

Apparatus for plating with a special head assembly